

Claims

What is claimed is:

- 5 1. A method of reducing power use in a device capable of operating at two or more power levels comprising:
selecting a range of power management timer settings for a first power management timer, the first power management timer for switching the device from a first power level to a second power level wherein portions of the device are de-
10 energized;
calculating an estimated energy value to complete a series of tasks for each of a plurality of settings within the range of power management timer settings; and
selecting a power management timer setting from the range of power management timer settings based on the estimated energy value to complete a series of tasks for each
15 of the plurality of settings within the range of settings.
2. The method of claim 1, wherein calculating an estimated energy value to complete a series of tasks for each of a plurality of settings within the range of power management timer settings comprises:
20 calculating a first energy value representing energy used by the device to handle tasks received when the device is in the first power level;
calculating a second energy value representing energy used by the device to handle tasks received when the device is in a transition from the first power level to the second power level;
25 calculating a third energy value representing energy used by the device to handle tasks received when the device is in the second power level; and
adding the first energy value, second energy value, and third energy value.
3. The method of claim 1, wherein selecting a range of power management timer settings
30 further comprises selecting a range of power management timer settings for a second power management timer, the second power management timer for switching the device from the second power level to a third power level wherein additional portions of the device are de-energized.

4. The method of claim 3, wherein calculating an estimated energy value to complete a series of tasks for each of a plurality of settings within the range of power management timer settings comprises:
- 5 calculating a first energy value representing energy used by the device to handle tasks received when the device is in the first power level;
- calculating a second energy value representing energy used by the device to handle tasks received when the device is in a transition from the first power level to the second power level;
- 10 calculating a third energy value representing energy used by the device to handle tasks received when the device is in the second power level;
- calculating a fourth energy value representing energy used by the device to handle tasks received when the device is in a transition from the second power level to the third power level;
- 15 calculating a fifth energy value representing energy used by the device to handle tasks received when the device is in the third power level; and
- adding the first energy value, second energy value, third energy value, fourth energy value, and fifth energy value.
- 20 5. The method of claim 3, wherein selecting an power management timer setting from the range of power management timer settings comprises selecting a first power management timer setting and selecting a second power management timer setting.
6. The method of claim 1, further comprising modeling throughput for the device based on
- 25 the range of power management timer settings.
7. The method of claim 6, wherein modeling throughput comprises calculating a total throughput delay incurred by processing a series of tasks value for each of a plurality of settings within the range of power management timer settings.
- 30 8. The method of claim 7, wherein calculating the total throughput delay incurred by processing a series of tasks comprises:

determining a time for the device to handle a task received when the device is in the first power level;

calculating a first throughput delay value representing time for the device to handle tasks received when the device is in a transition from the first power level to a second power level minus time for the device to handle tasks received when the device is

5 in the first power level;

calculating a second throughput delay value representing time for the device to handle tasks received when the device is in the second power level minus time for the device to handle a task received when the device is in the first power level; and

10 adding the first throughput delay value and second throughput delay value.

9. The method of claim 6, wherein selecting an power management timer setting from the range of power management timer settings further comprises selecting an power management timer setting based on total throughput delay incurred by processing a series
- 15 of tasks.

10. A system to reduce power use in a device capable of operating at two or more power levels comprising:
a processor; and
a memory coupled with and readable by the processor and having stored therein a series
5 of instructions that, when executed by the processor, cause the processor to select a range of power management timer settings for a first power management timer, the first power management timer for switching the device from a first power level to a second power level wherein portions of the device are de-energized, calculate an estimated energy value to complete a series of tasks for each of a plurality of
10 settings within the range of power management timer settings, and select an power management timer setting from the range of power management timer settings based on the estimated energy value to complete a series of tasks for each of the plurality of settings within the range of settings.
11. The system of claim 10, wherein calculating an estimated energy value to complete a series of tasks for each of a plurality of settings within the range of power management timer settings comprises:
calculating a first energy value representing energy used by the device to handle tasks
received when the device is in the first power level;
20 calculating a second energy value representing energy used by the device to handle tasks received when the device is in a transition from the first power level to the second power level;
calculating a third energy value representing energy used by the device to handle tasks
received when the device is in the second power level; and
25 adding the first energy value, second energy value, and third energy value.
12. The system of claim 10, wherein selecting a range of power management timer settings further comprises selecting a range of power management timer settings for a second power management timer, the second power management timer for switching the device
30 from the second power level to a third power level wherein additional portions of the device are de-energized.

13. The system of claim 12, wherein calculating an estimated energy value to complete a series of tasks for each of a plurality of settings within the range of power management timer settings comprises:
- calculating a first energy value representing energy used by the device to handle tasks
5 received when the device is in the first power level;
- calculating a second energy value representing energy used by the device to handle tasks
received when the device is in a transition from the first power level to the second
power level;
- calculating a third energy value representing energy used by the device to handle tasks
10 received when the device is in the second power level;
- calculating a fourth energy value representing energy used by the device to handle tasks
received when the device is in a transition from the second power level to the third
power level;
- calculating a fifth energy value representing energy used by the device to handle tasks
15 received when the device is in the third power level; and
- adding the first energy value, second energy value, third energy value, fourth energy
value, and fifth energy value.
14. The system of claim 12, wherein selecting an power management timer setting from the
20 range of power management timer settings comprises selecting a first power management
timer setting and selecting a second power management timer setting.
15. The system of claim 10, further comprising modeling throughput for the device based on
the range of power management timer settings.
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16. The system of claim 15, wherein modeling throughput comprises calculating a total
throughput delay incurred by processing a series of tasks for each of a plurality of settings
within the range of power management timer settings.
- 30 17. The system of claim 16, wherein calculating the total throughput delay incurred by
processing a series of tasks comprises:
- determining a time for the device to handle a task received when the device is in the first
power level;

- calculating a first throughput delay value representing time for the device to handle tasks received when the device is in a transition from the first power level to a second power level minus time for the device to handle a task received when the device is in the first power level;
- 5 calculating a second throughput delay value representing time for the device to handle tasks received when the device is in the second power level minus time for the device to handle a task received when the device is in the first power level; and adding the first throughput delay value and second throughput delay value.
- 10 18. The system of claim 15, wherein selecting an power management timer setting from the range of power management timer settings further comprises selecting an power management timer setting based on total throughput delay incurred by processing a series of tasks.

19. A machine-readable medium having stored thereon a series of instructions representing a routine to reduce power use in a device capable of operating at two or more power levels, the routine, when executed by a processor, causes the processor to:
- select a range of power management timer settings for a first power management timer,
- 5 the first power management timer for switching the device from a first power level to a second power level wherein portions of the device are de-energized;
- calculate an estimated energy value to complete a series of tasks for each of a plurality of settings within the range of power management timer settings; and
- select an power management timer setting from the range of power management timer
- 10 settings based on the estimated energy value to complete a series of tasks for each of the plurality of settings within the range of settings.
20. The machine-readable medium of claim 19, wherein calculating an estimated energy value to complete a series of tasks for each of a plurality of settings within the range of
- 15 power management timer settings comprises:
- calculating a first energy value representing energy used by the device to handle tasks received when the device is in the first power level;
- calculating a second energy value representing energy used by the device to handle tasks received when the device is in a transition from the first power level to the second
- 20 power level;
- calculating a third energy value representing energy used by the device to handle tasks received when the device is in the second power level; and
- adding the first energy value, second energy value, and third energy value.
- 25 21. The machine-readable medium of claim 19, wherein selecting a range of power management timer settings further comprises selecting a range of power management timer settings for a second timer, the second power management timer for switching the device from the second power level to a third power level wherein additional portions of the device are de-energized.
- 30 22. The machine-readable medium of claim 21, wherein calculating an estimated energy value to complete a series of tasks for each of a plurality of settings within the range of power management timer settings comprises:

calculating a first energy value representing energy used by the device to handle tasks
received when the device is in the first power level;

calculating a second energy value representing energy used by the device to handle tasks
received when the device is in a transition from the first power level to the second
5 power level;

calculating a third energy value representing energy used by the device to handle tasks
received when the device is in the second power level;

calculating a fourth energy value representing energy used by the device to handle tasks
received when the device is in a transition from the second power level to the third
10 power level;

calculating a fifth energy value representing energy used by the device to handle tasks
received when the device is in the third power level; and

adding the first energy value, second energy value, third energy value, fourth energy
value, and fifth energy value.

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23. The machine-readable medium of claim 19, wherein selecting an power management
timer setting from the range of power management timer settings comprises selecting a
first power management timer setting and selecting a second power management timer
setting.

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24. The machine-readable medium of claim 19, further comprising modeling throughput for
the device based on the range of power management timer settings.

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25. The machine-readable medium of claim 24, wherein modeling throughput comprises
calculating a total throughput delay incurred by processing a series of tasks value for each
of a plurality of settings within the range of power management timer settings.

26. The machine-readable medium of claim 25, wherein calculating the total throughput delay
incurred by processing a series of tasks comprises:

30 determining a time for the device to handle a task received when the device is in the first
power level;

calculating a first throughput delay incurred by processing a series of tasks value
representing time for the device to handle tasks received when the device is in a

transition from the first power level to a second power level minus time for the device to handle a task received when the device is in the first power level; calculating a second throughput delay value representing time for the device to handle tasks received when the device is in the second power level minus time for the device to handle a task received when the device is in the first power level; and adding the first throughput delay value and second throughput delay value.

27. The machine-readable medium of claim 24, wherein selecting an power management timer setting from the range of power management timer settings further comprises selecting an power management timer setting based on total throughput delay incurred by processing a series of tasks.